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ATTACHMENT JC20 Rec'd PCT/PTO 30 SEP 2009

FASTENER**CROSS REFERENCE TO RELATED APPLICATIONS**

[0001] This application claims priority to British patent application 0307644.5, filed April 2, 2003 and PCT/SE2004/000044, filed January 16, 2004.

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a fastener which may be useful in securing in position, within a vehicle, an air-bag of the "inflatable curtain" type.

BRIEF SUMMARY OF THE INVENTION

[0002] A conventional inflatable curtain air-bag, when initially assembled, is contained within a long package, with a plurality of mounting lugs extending from the package. Each mounting lug is to be secured to an appropriate mount provided within a motor vehicle. If each mount is in the form of a threaded hole which is to receive a bolt passing through the lug, it is often difficult for the package to be held in position whilst the bolts are introduced through the lugs and engaged with the threaded bores.

[0003] The present invention seeks to provide an improved fastener useful for securing an air-bag in position in a motor vehicle, and may also be useful for many other applications.

[0004] Accordingly, the present invention provides a fastener including a bolt, the bolt having a head and a threaded shank extending from the head, the threaded shank being dimensioned to co-operate with a predetermined threaded bore, the free

end of the shank remote from the head being provided with an end cap, the end cap having a yieldable formation to engage frictionally with the threaded bore.

[0005] Preferably, the end cap is a separate component which is secured to the bolt.

[0006] Advantageously, the end cap is rotatably mounted on the bolt.

[0007] Conveniently, the shank of the bolt is provided with an axially extending projection having an enlarged head, the cap having an internal bore dimensioned to receive the projection and the head.

[0008] Preferably, the end cap is provided with a plurality of radially outwardly extending flanges.

[0009] Advantageously, at least some of the flanges have a diameter greater than the diameter of the threaded shank of the bolt.

[0010] Conveniently, at least some of the flanges have chamfered leading edges.

[0011] Preferably, at least some of the flanges are segmented.

[0012] Advantageously, at least a terminal flange has a diameter less than that of succeeding flanges.

[0013] The present invention also provides a method of mounting an inflatable curtain in position in a motor vehicle, the method comprising the steps of utilising a fastener as defined above, inserting the end cap of the fastening as a frictional fit into a threaded bore and subsequent tightening the bolt into the threaded bore.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] In order that the invention may be more readily understood, and so that further feature thereof may be appreciated, the invention will be described, by way of example, with reference to the accompanying drawings in which:

[0015] FIGURE 1 is a diagrammatic side of an air-bag in the form of a so-called "inflatable curtain" when in the inflated condition;

[0016] FIGURE 2 is an enlarged view of an upper part of the inflatable curtain;

[0017] FIGURE 3 is a side view of a bolt forming part of the fastener in accordance with the present invention;

[0018] FIGURE 4 is a side view of an end cap to be mounted in the bolt of Figure 3;

[0019] FIGURE 5 is perspective view of the end cap; and

[0020] FIGURE 6 is an enlarged partially broken away side view of the end cap.

DETAILED DESCRIPTION OF THE INVENTION

[0021] Referring initially to Figure 1 of the accompanying drawings, the cabin of a motor vehicle 1 is illustrated showing, diagrammatically, an air-bag 2 in the form of an "inflatable curtain". The air-bag 2 is divided into a plurality of substantially vertical chambers or cells by seams provided within the air-bag, and the air-bag is dimensioned to be received initially within a channel recess 3 which extends along the A post 4 of the vehicle, along the roof line 5 above the door openings and part way down the C post 6. Air-bags of this type are well known.

[0022] Figure 2 illustrates part of the upper edge 7 of an inflatable curtain air-bag 2, showing that the air-bag is provided with a plurality of spaced apart apertured lugs 8 and 9.

[0023] When the inflatable curtain air-bag 2 is to be mounted in the motor vehicle typically the inflatable curtain is in the form of a package subassembly, with the mounting lugs 8 and 9 protruding from the package. The mounting lugs 8 and 9 are to be aligned with corresponding threaded apertures formed in the A post 4, roof

line 5, and C post 6 of the vehicle, and bolts are to be passed through the apertures and the apertured lugs to be engaged with the corresponding threaded apertures in the vehicle. It may be require considerable manual dexterity for a single operative to hold the subassembly package air-bag in position and locate the bolts appropriately.

[0024] Figures 3 through 6 illustrate a fastener which may facilitate the task of the mounting air-bag 2 to vehicle 1.

[0025] The fastener includes of a bolt 10 which is provided, in the described embodiment, with a separated end cap 20. The end cap 20 has radially outwardly directed flanges adapted to effect a friction fit with a threaded bore dimensioned to receive the threaded part of the bolt.

[0026] Thus in using the fastener of this invention, each fastening may be swiftly engaged with a threaded aperture simply by inserting the end cap into a threaded aperture. Subsequently the bolt 10 may be tightened in the conventional way.

[0027] Figure 3 illustrates a metallic bolt 10. The bolt 10 is provided with a conventional hexagonal head 11 and a conventional threaded shank 12. At the free end of the threaded shank 12 there is an axially extending cylindrical projection 13 which terminates with a frustoconical head 14. An end cap 20 is to be received on the projection 13 at its head 14.

[0028] Figure 4 illustrates an end cap 20 to be received on the bolt 10. The end cap 20 comprises a main cylindrical body portion 21. The body portion 21 is provided with an axially extending bore 22 dimensioned to receive the projection 13 and the head 14. The end cap 20 may thus be mounted on the bolt 10 in such a way that the end cap may rotate freely about the axis of the bolt.

[0029] The exterior of the cylindrical body 21 is provided with a plurality of radially outwardly directed flanges 23. The flanges 23 are evenly spaced along the length of the body 21. The flanges 23 have an outer diameter which is at least the same as the outer diameter of the threaded shank 12 of the bolt 10, but preferably at least some of the flanges 23 have a diameter greater than the diameter of the threaded shank 12 of the bolt 10.

[0030] As can be seen in Figures 4 and 5, at least some of the flanges 23 are segmented, so that each flange is in the form of four equi-angularly spaced separate sectors, the sectors of adjacent flanges being co-aligned to form channels or passages 24 between adjacent sets of sectors of the flanges.

[0031] As can be seen more clearly in Figure 6 a terminal flange 25 is of relatively small diameter, the next adjacent flange 26 is of greater diameter and the next adjacent flange 27 is of even greater diameter, the remaining flanges having the same diameter as the flange 27.

[0032] It can be seen, from Figure 6, that the forward facing lip of each flange is chamfered at 28 to facilitate the insertion of the end cap 20 into a threaded aperture.

[0033] A ridge 29 extends axially passing between adjacent flange sections.

[0034] It is to be appreciated that when a fastener of the kind shown in Figures 3-6 are used to secure an inflatable curtain air-bag 2 in position, each fastener may relatively easily be passed through an aperture formed in lugs 8 and 9 provided on the inflatable curtain air-bag 2 so that the end cap 20 become frictionally engaged within the threaded bore which is provided to receive the appropriate bolt. There is no need to ensure that the threading on the bolt 10 is aligned with the threading in the aperture and there is no need to rotate the bolt 10. A simple axial

movement of the bolt 10 will force the end cap 20 into the threaded bore. The fact that the terminal flange 25 is of relatively small diameter will make it easy for that flange to become aligned with the bolt 10. The gradual increase in the sizes of the flanges 22 will facilitate the subsequent insertion of the end cap 20 into the threaded bore. The chamfering 28 provided at the leading edge of each flange 23 will facilitate a flexing of each flange as it is inserted into the bore, thus ensuring a good frictional grip between the flanges and the bores.

[0035] When all of the fastener have been inserted in position in this way, the frictional grip effected by the fastener to the threaded bores provided in the motor vehicle will be sufficient to hold the inflatable curtain air-bag 2 in position. Using a spanner, and applying further axial pressure, the threaded shank 12 of the bolt 10 of a fastening may then be brought into engagement with the threaded aperture and the bolt may be fastening in the conventional manner.

[0036] Whilst one embodiment of a fastener in accordance with the invention has been described, it is to be appreciated that many modifications may be effected. For example, the end cap 20 and the bolt 10 may be formed integrally, being moulded of a single piece of appropriate plastic material. Whilst the end cap 20 has been illustrated as having substantially planar flanges 23, it is to be appreciated that the flanges may be angled in the form of barbs. Also it is to be appreciated that the end cap 20 may be provided with some other yieldable engagement structure to engage frictionally with the threaded bores. Thus the end cap 20 may be provided with an outer covering of a foam material, for example.

[0023] While the above description constitutes the preferred embodiment of the present invention, it will be appreciated that the invention is susceptible to

modification, variation and change without departing from the proper scope and fair meaning of the accompanying claims.

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